

Elliptochthoniidae, A New Mite Family (Acarina: Oribatei) From Mineral Soil In California

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Abstract: A new oribatid mite, *Elliptochthonius profundus* n. gen., n. sp., is described from mineral soil in a coniferous ecosystem in northern California, and a new family, the Elliptochthoniidae, is proposed. Relationships with the Parhypochthonoidea and Enarthronota are discussed.

Grandjean (1947) proposed the Enarthronota, without giving it a specific hierarchic rank, to include all the diverse macropyline oribatid families in which the notogaster is provided with one to three transverse sutures. In his revision of major groups in the Oribatei (Grandjean, 1969), the Enarthronota was divided into seven superfamilies. Another macropyline superfamily, the Parhypochthonoidea Hammen, was considered as having rank, again unspecified, equivalent to the Enarthronota. Balogh (1972) more conservatively placed both these groups, with some deletions from the Enarthronota, in the Arthronota. The purpose of this paper is to describe an unusual new family, genus and species of oribatid mite related to these groups, which may prove important in future studies of higher categories in the Oribatei.

The specimens were part of a quantity of oribatids sent to me for identification by John M. Wenz, University of California, Berkeley, in conjunction with a study of the effects of air pollutants on a coniferous ecosystem in California, sponsored by the Environmental Protection Agency. The site was a mixed stand of ponderosa and jeffrey pines (*Pinus ponderosa* Laws. and *P. jeffreyi* Grev. & Balf.) at Likely Mill, Modoc Co. The new species, collected in June, 1972, appears restricted to the deeper soil strata. It was never collected in the organic layers or in the upper 10 cm of mineral soil.

The nomenclature and descriptive terminology used below are primarily those formulated by Grandjean (1935, 1939, 1940, 1947, 1949).

Elliptochthoniidae n. fam.

This family is distinguished from other families of the Macropylina by the following combination of characters:

1. The notogaster has a single transverse dorsal suture which continues laterally and ventrally to form a membranous delination between the genital-agenital plate and epimere IV. The result is a completely movable opisthosoma, or pygidium.

2. The division of the genital and aggenital plates is incomplete, and disappears in the posterior third. The adanal plates are broadly fused posteriorly.

3. The latero-opisthosomal gland is present.

4. The gnathosoma is stegasime and has undergone structural and chaetotaxic modifications, including the presence of a single pair of adoral setae, the fusion of the palpal trochanter and femur, and the reduced setation of the palp (see description).

Type genus: *Elliptochthonius* n. gen.

The name is derived from the Greek *elleipsis*, meaning oval, and *chthon*, meaning earth. Because of the monotypic nature of the family, I make no attempt here to delineate generic characters.

Type species: *Elliptochthonius profundus* n. sp.

Elliptochthonius profundus n. sp.

The specific epithet is the Latin *profundus*, meaning deep.

Female

Body elongate, oval, dorso-ventrally flattened. Average length of 5 slide-mounted specimens 576μ (range 565μ – 595μ). Average width at level of seta *d3* 202μ (range 200μ – 209μ). Color in alcohol is light yellow.

Prodorsum: Prodorsum roughly triangular in shape from above (Fig. 1); rostrum rounded centrally, but laterally with irregular teeth (Fig. 3). Integument very finely pitted, with small superimposed tubercles in the postero-medial region. Podocephalic canal (*cpc*) extends from the point of lateral articulation with infracapitulum to level of acetabulum I.

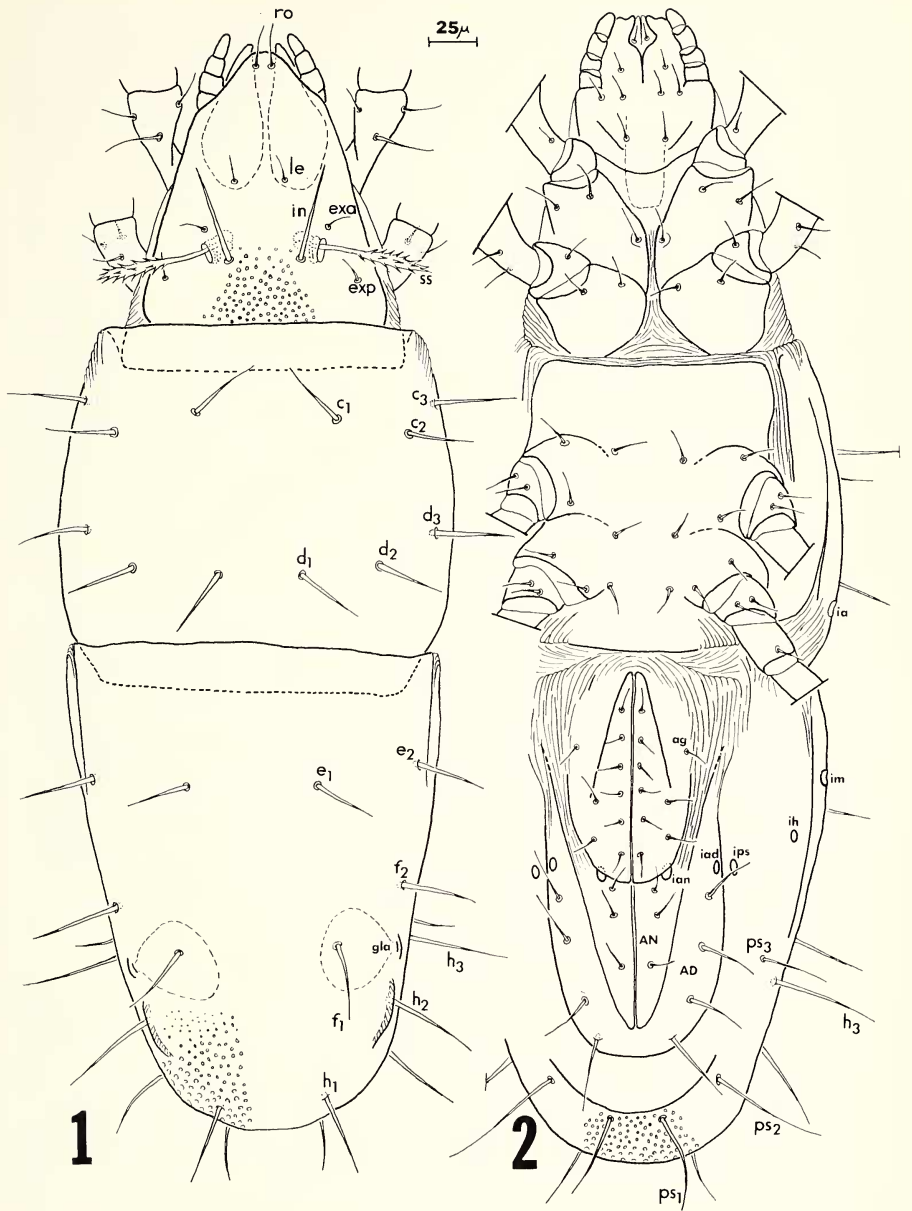
Normal setation present: rostral setae (*ro*), lamellar setae (*lc*) and exobothridial setae (*exa*, *exp*) fine, simple, short; interlamellar setae (*in*) elongate, lanceolate, similar to notogastral setae; sensillus (*ss*) clavate, distal portion heavily barbed.

Notogaster: Notogaster widest at level of seta *d3*, tapering posteriorly (Fig. 1). Integumental pitting inconspicuous anterior to setal row *e* or *f*, increasing in strength posteriorly; strong pitting abruptly stops ventrally at constriction line running parallel to setal row *ps* (Figs. 2, 3).

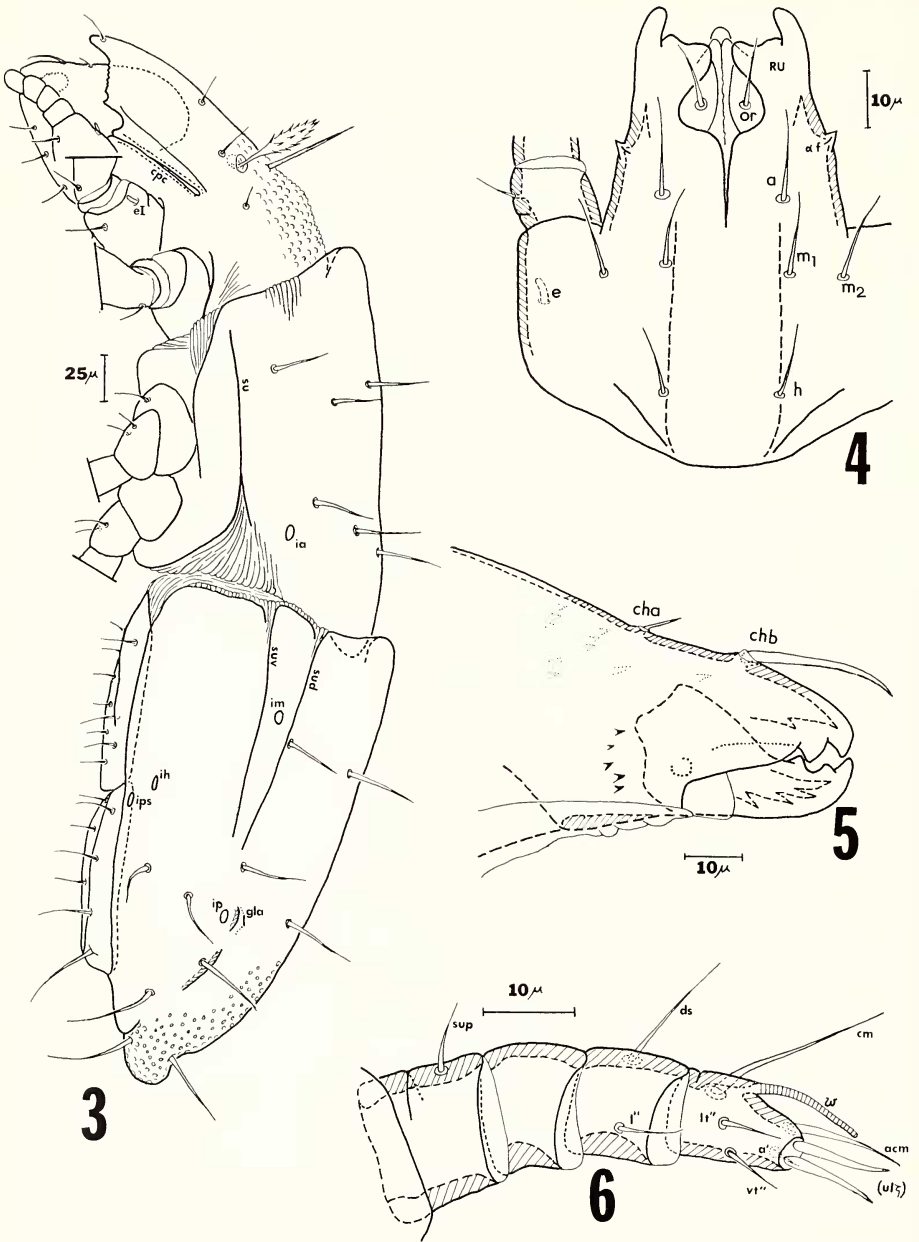
Dorsal suture centrally located between setal rows *d* and *e*, continuing latero-ventrally until joining the ventral membranes. Anterior half (notaspis) with six pairs of minutely barbed setae (*c1*, *c2*, *c3*, *d1*, *d2*, *d3*) and one pair of cupules (*ia*). An expansion suture (*su*) is present laterally. Posterior half (pygidium) with 10 pairs of setae (*e1*, *e2*, *f1*, *f2*, *h1*, *h2*, *h3*, *ps1*, *ps2*, *ps3*) and four pairs of cupules (*im*, *ip*, *ih*, *ips*). Latero-opisthosomal gland (*gla*) present, its opening dorsal to cupule *ip* and separated from it by a ridge-like thickening. Another thickening present dorsal to seta *h2*. Two expansion sutures present laterally (*sud*, *suv*) on either side of cupule *im*. Posteriorly, a sharp dorso-ventral constriction gives appearance of a thickened rim (Fig. 3).

Ventral Plates: Epimeres I and II separated medially by membrane; epimeres III and IV completely fused medially (Fig. 2). Laterocoxal seta *e1* present. Setal formula 3-2-3-4 for epimeres I-IV (not including *e1*).

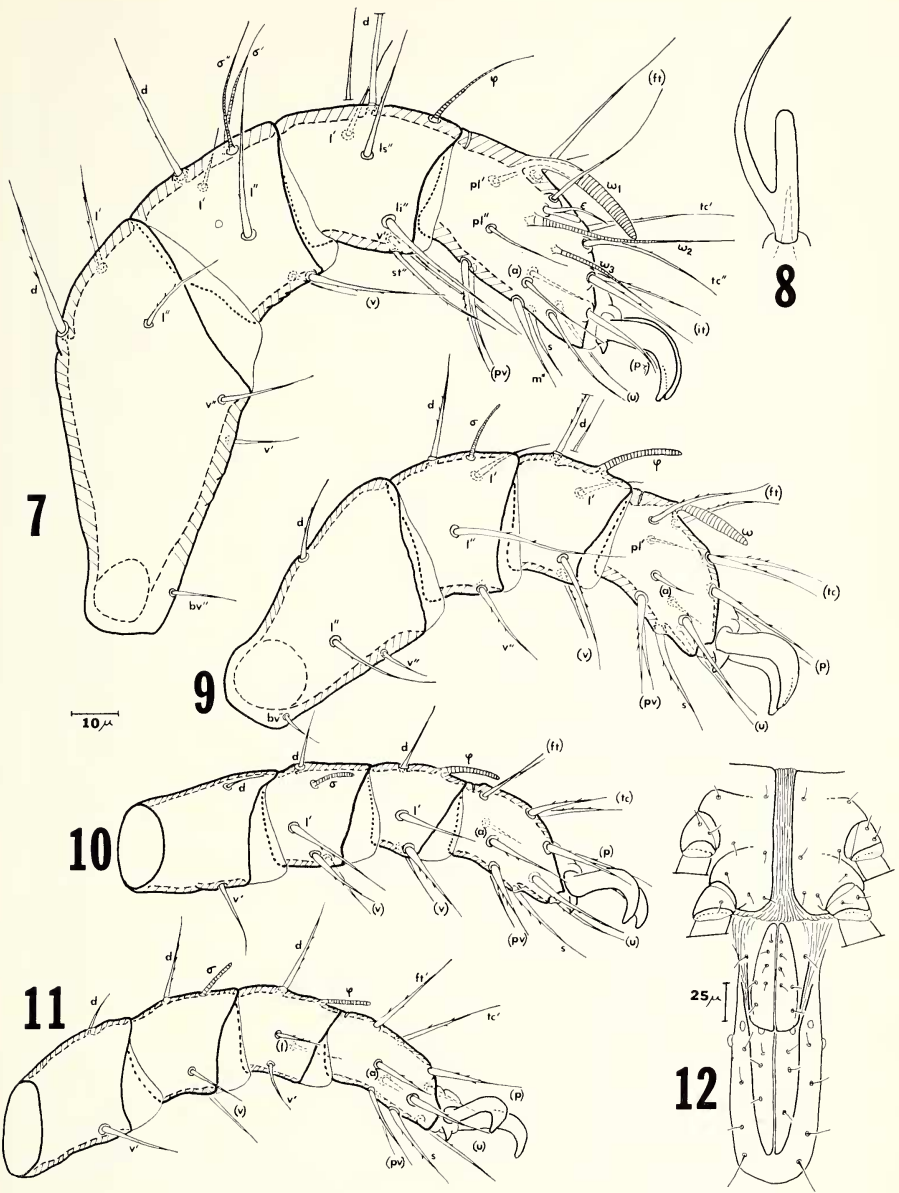
Genital plates with eight simple setae each, six in paraxial row, two in antiaxial row; posteriorly fused with aggenital plates, which have one seta (*ag*). Anal plates each with three simple setae and one cupule (*ian*). Adanal plates posteriorly fused; each with four setae, longer than anal setae, and one cupule (*iad*).



Elliptochthonius profundus n. gen., n. sp.: Fig. 1. Adult female, dorsal aspect. Fig. 2. Same, ventral aspect.



Elliptochthonius profundus n. gen., n. sp.: Fig. 3. Adult female, lateral aspect (slightly laterally flattened). Fig. 4. Infracapitulum. Fig. 5. Right chelicera, antiaxial aspect. Fig. 6. Right palp, antiaxial aspect (slightly from below).



Elliptochthonius profundus n. gen., n. sp.: Fig. 7. Right leg I, antiaxial aspect. Fig. 8. Famulus. Fig. 9. Right leg II, antiaxial aspect. Fig. 10. Left leg III, antiaxial aspect. Fig. 11. Left leg IV, antiaxial aspect (slightly from below). Fig. 12. Tritonymph, epimera III-IV and ventral plates. All legs to same scale.

Gnathosoma: Infracapitulum simple, without secondary articulation (Fig. 4); four pairs of setae on ventral surface (*a*, *m1*, *m2*, *h*); one pair of adoral setae (*or*) on lateral lips. Rutellum (*RU*) with a large thumb-like projection dorso-laterally. Antiaxial fissure (*α f*) associated with lateral tooth-like structure. Laterocoxal seta *e* thick, blunt.

Chelicerae chelate-dentate (Fig. 5); fixed digit bidentate, movable digit tridentate. Seta *cha* small, simple; seta *chb* about four times as long, rapidly tapering distally. Chitinous barbs present on both antiaxial and paraxial faces; numbers and placement somewhat variable.

Palp four-segmented; trochanter and femur fused (Fig. 6). Femur with one seta, genu with none, tibia with two, tarsus with seven setae (two of them, *ul'* and *ul''* eupathidic) and one solenidion (*ω*).

Legs: Setal formulas for the legs, from trochanter to tarsus, are as follows (not including the famulus on tarsus I): leg I (0-6-5-6-18); leg II (1-4-4-4-14); leg III (2-2-4-4-13); leg IV (2-2-3-4-11). Setae distributed as in Figs. 7, 9, 10, 11. Most setae are inconspicuously barbed. Only proral setae (*p*) on tarsus I appear to be eupathidic, but this is not certain.

Famulus (*ε*) of tarsus I spatulate, with single long lateral bract (Fig. 8).

Solenidial formulas for genu, tibia and tarsus as follows: leg I (2-1-3); leg II (1-1-1); leg III (1-1-0); leg IV (1-1-0). Ambulacrum of all legs tridactylous, with a highly reduced central claw.

Tritonymph

Very similar to adult female with exceptions as follow. Length and width of single specimen 450 μ and 177 μ , respectively. Epimeres III and IV longitudinally divided by wide membranous band (Fig. 12). Genital plate with six setae, only four in paraxial row. Leg chaetotaxy identical to adult. Ambulacrum of all legs monodactylous.

MATERIAL EXAMINED

Seven specimens, six adult females and one tritonymph, were studied. Deposition will be as follows: holotype female (slide preparation) to the U.S. National Museum, Washington, D.C.; paratype female (alcoholic) and tritonymph (slide preparation) to the Museum of Comparative Zoology, Cambridge, Massachusetts; paratype female (slide preparation) to the Canadian National Collection, Ottawa, Ontario; three paratype females retained by author.

REMARKS

1. In five of the females examined there was identical leg setation, and these were the specimens utilized in the leg descriptions. In the sixth there was variability, specifically the lack of seta *a''* on tarsus III, seta *d* on genu IV and seta *v'* on tibia IV. Each loss was restricted to a single leg, the other of the pair being typical.

2. There does not seem to be a true correspondence between the sutures which I call expansion sutures (*su*, *sud*, *suv*) on the notogaster and the supra-pleural band described by Grandjean (1947) in the *Enarthronota*. This band is dorsal to cupule *ia* in the latter group.

3. Grandjean (1969) discusses at length the types of body articulations (holoidy, dichoidy, ptychoidy) in sclerotized oribatids. To these I now add the term *trichoidy*, defined as the condition of having both the protero-hysterosomatic articulation and a podo-opisthosomatic articulation, exemplified by the Elliptochthoniidae.

4. The placement of this family in a major group is difficult. If we assume that the Parhypochthonoidea and Enarthronota are part of the same monophyletic series, the Arthronota, then the placement of the Elliptochthoniidae in this series seems certain. Based on available information it is more likely that Grandjean's (1969) system is correct, that is, the Arthronota is biphyletic.

Grandjean (1969) has listed the principal characters utilized in delineating his major macropyline groups. To gain insight on relationships let us examine those characters which differ among the three groups in question from the standpoint of ancestral versus derived states.

The latero-opisthosomal gland is present (ancestral) in the Parhypochthonoidea and Elliptochthoniidae; it is absent (derived) in the Enarthronota. The cupules *iad*, *ian* are present (ancestral) in the former two groups and lacking (derived) in the Enarthronota. The adult leg ambulacra have a regressive central claw (derived) in the Elliptochthoniidae and *Parhypochthonius*; the Enarthronota are primarily monodactylous (also derived). The Parhypochthonoidea have three pairs of adoral setae (ancestral); the Elliptochthoniidae have one pair, as do the Brachychthoniidae of the Enarthronota (Grandjean, 1963; Reeves and Marshall, 1971). The latter family also often has a derived solenidiotaxy identical to the Elliptochthoniidae, whereas that of the Parhypochthonoidea is ancestral in comparison. Sclerotization is a derived state, present in the Enarthronota and Elliptochthoniidae and lacking in the Parhypochthonoidea, but it has obviously occurred in a number of unrelated acarine lineages.

Hennig (1966) states that relationships must be proven on the basis of shared derived (synapomorphous) characters, not shared ancestral ones. Of the similarities noted above, synapomorphy can be shown between the Elliptochthoniidae and the Brachychthoniidae for the number of adoral setae and solenidiotaxy. It is risky, however, to base relationships on similar degrees of numerical regression, as Grandjean (1935) observed with solenidiotaxies. The other synapomorphic character to be considered is the tridactylous adult ambulacrum with a regressive central claw, shared by the Elliptochthoniidae and *Parhypochthonius*; the central claw is lacking in the second parhypochthonoid genus, *Gehypochthonius*. Although both this and the monodactylous condition are the result of regression from ancestral tridactyly, they are obviously of two different lineages.

Inclusion of the Elliptochthoniidae in the Parhypochthonoidea would be acceptable if the diagnostic criteria of unsclerotized integument and the related

stegasime condition were omitted. If future workers do not wish to do so, a separate superfamily for the new family seems unescapable.

5. I am familiar, and often agree, with criticisms of the present "top-heavy" classification of oribatids caused by the erection of many monotypic higher taxa. However, such problems are most significant in the Brachyphylina. Here there is extensive development of secondary integumental structures in the adult stage which confuse relationships, combined with a general lack of knowledge of immatures, as discussed by Balogh (1972). For the most part, the Macropylina presents little difficulty in this regard, and monotypic taxa are more readily accepted. In fact, they are expected in relict groups such as the one described here.

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